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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/754,390
Filing Date: January 09, 2004
Appellant(s): PRASAD ET AL.

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Attorneys
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed April 29, 2008 appealing from the Office action mailed January 3, 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

4,668,557	LAKES	5-1987
6,126,532	SEVILLA et al	10-2000
6,120,353	SUZUKI et al	9-2000
6,241,596	OSTERHELD et al	6-2001
5,949,927	TANG	9-1999

PCT Publication WO03/058698A1, FURUKAWA et al. (December 26, 2002), paragraphs 8, 11 and 13

U.S. Patent Publication 2005/0107007A1, FURUKAWA et al. (May 19, 2005), paragraphs 8, 11 and 13

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-7 and 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reinhardt ('902) in view of Lakes (4,668,557) and Furukawa et al. (WO03/058698A1; US publication 2005/0107007 referenced as English translation).

In reference to claim 1, Reinhardt discloses a polishing pad made of polyester and polyether polyurethanes and further discloses that the pads may be formed by foaming (col. 2, lines 43-48), thus forming the polishing pad out of a polyester and polyether polyurethane foam that is inherently porous (based on the definition of foam of "Any of various light, **porous**, semirigid or spongy materials[1]"). However, Reinhardt fails to disclose that the porous polymeric material has a Poisson's ration less than zero.

Lakes discloses a method of making polymeric foams that have negative Poisson's ratios and teaches that the negative Poisson's ration polymeric foams can replace polymeric foams having positive Poisson's ratios in many applications to provide improved properties. Lakes further disclose that polymeric foams having negative Poisson's ratios are more advantageous than conventional foam materials in applications where superior strength and abrasion resistance are desired along with a compliant foam (col. 4, line 64-col. 5, line 3). It is well known in the art that superior strength and abrasion resistance are desired properties for polishing pads and Furukawa specifically discloses that high abrasion resistance is a requirement for long life of polishing pads (paragraph 8) and further teaches that polishing pads made of foamed polyurethane (such as the pads disclosed by Reinhardt) generally fail to have the desired abrasion resistance to provide long life of the polishing pad. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to replace the conventional polyurethane foam of the Reinhardt polishing pad with polyurethane foam having a Poisson's ration below zero, to improve strength and abrasion resistance, which are well known in the art as desired properties of polishing pads and will increase the life of the polishing pad, as taught by Furukawa.

In reference to claims 2 and 3, it further would have been obvious to one of ordinary skill in the art to produce the polyether polyurethane foam having a negative Poisson's ratio using the method disclosed by Lakes and Lakes further provides a specific example of a polyester foam that was produced using the disclosed method that

[1] *The American Heritage® Dictionary of the English Language, Fourth Edition*

has a Poisson's ration of -0.7 (col. 3, lines 38-62). Although Lakes does not disclose a specific example of a polyether polyurethane foam, it would be obvious that the polyether polyurethane foam of Reinhardt will have very similar properties to a polyester foam and once treated using the method of Lakes would have a Poisson's ratio similar to that of the treated polyester foam example of Lakes. Thus, it would have been obvious that the polyether polyurethane foam, having a Poisson's ratio of less than zero, would have a Poisson's ratio of about -0.7, which falls within the claimed range of about -0.8 to about -0.2.

In reference to claim 4, polyester, polyether and polyurethane are all materials that are well known as thermoplastic and/or thermoset polymers.

In reference to calms 5 and 6, Reinhardt discloses that the polishing pad is made of polyester and polyether polyurethanes, as discussed supra.

In reference to claim 7, Reinhardt discloses that the polymeric product will preferably have a density of greater than 0.5 g/cm^3 (col. 2, lines 60-64), which provides a range that overlaps the claimed range of 1 g/cm^3 or less, and thus provides a proper rejection of the claimed range (See MPEP §2131.03).

In reference to claims 16 and 17, Reinhardt further discloses that the polishing pad may comprise abrasive particles of alumina, silica, titania or ceria (col. 2, lines 49-59).

In reference to claims 18-20, it would be obvious to one of ordinary skill in the art at the time the invention was made to polish a work piece through the method disclosed

by Reinhardt that comprises providing a work piece to be polished, contacting the work piece with a chemical-mechanical polishing system comprising the polishing pad discussed supra and abrading (polishing, as disclosed by Reinhardt, is considered to be abrading) at least a portion of the surface of the work piece with the polishing system to polish the work piece (Col. 3, lines 24-30).

Claims 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reinhardt ('902) in view of Lakes (4,668,557) and Furukawa et al. (WO03/058698A1; US publication 2005/0107007 referenced as English translation) and further in view of Sevilla et al ('532).

Reinhardt in view of Lakes and Furukawa provides a polishing pad as discussed supra but fails to disclose that the pad has a void volume of about 75% or less or that the average pore diameter in the pad is between 0.1 and 2500 μm. Sevilla discloses a polishing pad made of a porous substrate and teaches that an average pore diameter from about 5 to 100 μm (microns) will enhance pad polishing performance (abstract, lines 5-7) and that a porosity or pore volume (void volume) between about 15% and 70%, preferably between 25% and 50%, has been found to yield acceptable polishing pads possessing the necessary flexibility and durability in use (col. 5, lines 28-34). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that the pad of Reinhardt, made of polyester and polyether polyurethane foam should possess pores with an average diameter between 5 and 100 μm to

enhance pad polishing performance and a porosity between 15% and 70% to provide the polishing pad with the necessary flexibility and durability for use.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Reinhardt ('902) in view of Lakes (4,668,557) and Furukawa et al. (WO03/058698A1; US publication 2005/0107007 referenced as English translation) and further in view of Suzuki et al ('353).

Reinhardt in view of Lakes and Furukawa provides a polishing pad as discussed supra but fails to disclose that the pores in the pad should have a pore density greater than about 10 pores/cm. Suzuki discloses a polishing method including a polishing pad and teaches that the surface roughness of the work piece is dramatically improved when finish polishing is conducted using a finish polishing pad with a pore density equal to or higher than a value (col. 3, 8-11) and further discloses a polishing pad with a pore density equal to or higher than 150 pores/cm^2 (approximately 12.2 pores/cm). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that the pad of Reinhardt, made of polyester and polyether polyurethane foam, should have a pore density greater than or equal to 150 pores/cm^2 in order to dramatically improve the finish of a work piece through polishing.

Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reinhardt ('902) in view of Lakes (4,668,557) and Furukawa et al. (WO03/058698A1; US publication 2005/0107007 referenced as English translation) and further in view of Osterheld et al ('596).

Reinhardt in view of Lakes and Furukawa provides a polishing pad as discussed supra but fails to disclose that the surface of the polishing pad should comprise of linear grooves in the form of an XY crosshatch. Osterheld discloses a method and apparatus for chemical mechanical polishing using a patterned pad and teaches that a plurality of slurry distribution/retaining grooves are distributed with a first portion extending linearly over the surface of the pad along the x-axis and a second portion extends linearly over the surface of the pad along the y-axis defining an X-Y grid pattern (col. 5, lines 7-14) and that the grooves are adapted to inhibit slurry or other fluids from flowing off the pad during operation. Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made that the pad of Reinhardt, made of polyester and polyether polyurethane foam, should have linear grooves in the form of an XY crosshatch in order to distribute a slurry while preventing the slurry from flowing off the pad during operation.

Claims 14, 15and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reinhardt ('902) in view of Lakes (4,668,557) and Furukawa et al. (WO03/058698A1; US publication 2005/0107007 referenced as English translation) and further in view of Tang ('927).

Reinhardt in view of Lakes and Furukawa provides a polishing pad as discussed supra but fails to disclose an optically transmissive region that has a light transmission of at least 10% at one or more wavelengths between 190nm and 3500nm. Tang discloses an *in-situ* monitoring technique for end point detection during chemical mechanical polishing planarization including a polishing pad with an optically

transmissive region. Tang teaches that the light source is capable of illuminating in the range of about 200 to 11,000 nm in wavelength and that when the wavelength is measured from the back side of the substrate (opposite light source) the wavelength is preferred to be 1,300 nm (col. 5, lines 6-12) which would be at least 11.8% of the light source being transmitted through the substrate. Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to provide the pad of Reinhardt, made of polyester and polyether polyurethane foam, with an optically transmissive region that has a light transmission of at least 11.8% at one or more wavelengths between 200nm and 11,000nm to monitor the end point during chemical mechanical polishing. It would also be obvious to polish a work piece by provide a work piece to be polished, contacting the work piece with a chemical mechanical polishing system comprising the pad of Reinhardt, made of polyester and polyether polyurethane foam with an optically transmissive region and abrading at least a portion of the surface of the work piece with this polishing system.

(10) Response to Argument

The appellant first argues that the Reinhardt and Lakes references individually fail to disclose the claimed subject matter. The Examiner agrees that each reference does not anticipate the claims, on their own. However, the Examiner maintains that the Reinhardt, Lakes and Furukawa references, when viewed together provide motivation to combine the teachings of the references to make obvious the appellant's claimed invention.

The appellant further argues that the Furukawa reference teaches away from the claimed invention because Furukawa discloses that open cell polymeric materials, such as those disclosed by Reinhardt, have drawbacks and are undesirable in polishing pads. However, the Reinhardt reference is provided as the base reference, and clearly discloses that foamed polymeric materials are used in the polishing pad of Reinhardt. The Furukawa reference is merely provided as extrinsic evidence to support the Examiner's statement that increased abrasion resistance is a desirable property in polishing pads, especially polishing pads that are made from foamed polymeric materials. The Furukawa reference is only relied upon for the discussion of the general background in the art of polishing pads. Thus the Examiner is not picking and choosing from teachings of the Furukawa reference and excluding other sections of the disclosure, as argued by the appellant, the Examiner does not refer to any of the teachings relating to the *actual invention* of Furukawa at all. Thus, the Examiner is not picking and choosing teachings of Furukawa, but merely referencing the disclosure of well known prior art that is made by Furukawa, which does support that it is well known in the art to form polishing pads from foamed (or porous) polymeric materials. Therefore, the Examiner maintains that the Furukawa reference provided as extrinsic evidence, does not actually teach away from the claimed invention and that the combination of Reinhardt and Lakes, in view of the evidence provided by Furukawa, provide clear motivation that make obvious the appellant's claimed invention.

The appellant does not make any additional arguments relating to the Sevilla, Suzuki, Osterheld or Tang references.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Bryan R Muller/

Examiner, Art Unit 3723

7/2/2008

Conferees:

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